SUPPORTING INFORMATION

Ecosphere

Grasshopper herbivory immediately affects element cycling but not export rates in an N-limited grassland system

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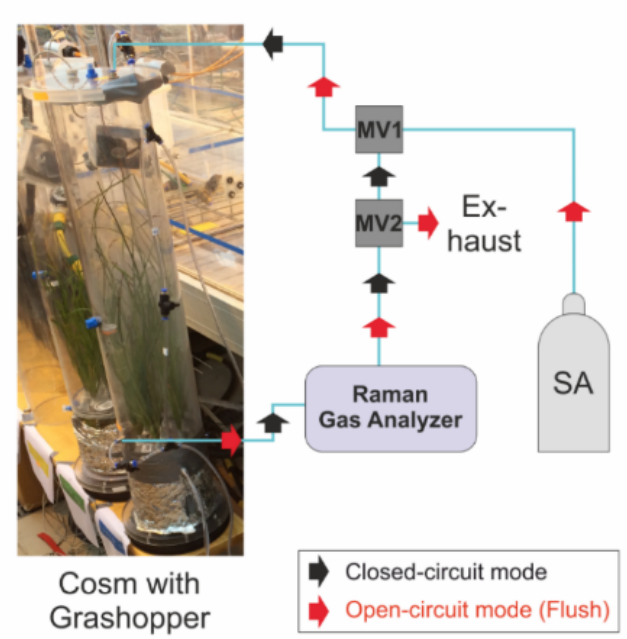

Figure S1: Schematic setup of the gas analysis system using a Raman gas sensor. The two different measurement modes are marked with different arrows. The flushing was done using CO_2-free synthetic air (SA). Switching between modes was performed with an automated magnetic valve (MV1 and MV2) system.

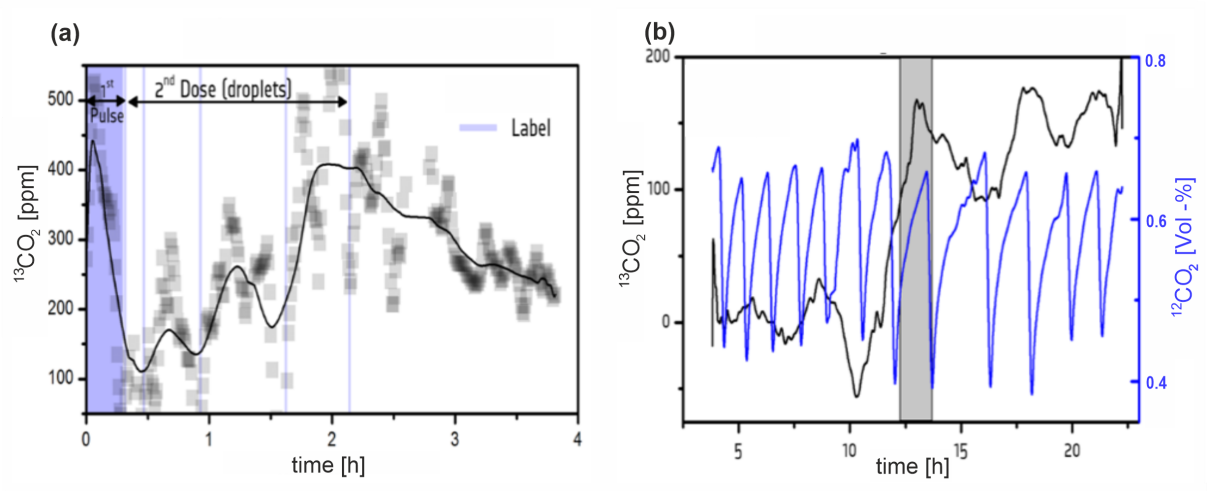

Figure S2: Example of the Raman concentration measurements of the $^{13}CO_2$ cycling in the upper and bottom unit of the treatment with 12 grasshoppers. a) $^{13}CO_2$ concentration during the pulse labeling in the upper unit. Dots represent the measured concentrations and the solid line depicts the averaged curvature. The addition of $^{13}CO_2$ lasted for approx. 2 hours. After each pulse (vertical blue lines), the $^{13}CO_2$ level in the headspace rose to a specific value and then decreased. b) Raman spectroscopic monitoring of the gas concentrations during soil respiration in the bottom unit. The concentration of $^{12}CO_2$ (blue line; right axis) showed a linear rise until the experimentally defined upper limit (here 0.6 Vol-%) was reached. Subsequently, the unit was flushed with synthetic air for a new respiration cycle. The first $^{13}CO_2$ evolution (black line; left axis) due to root and rhizo-microbial respiration occurred after 14 h (grey background).

Table S1: Results of the LMEM including all respective treatments (C, L, LG, LG^{15}N) as treatment levels. Type was specified for solution type (throughfall, suction cup, lysimeter), for biomass compartments (leave, roots in 0-4 and 4-12 cm soil depth), and for soil (0-4 and 4-12 cm soil depth), respectively. Mesocosm ID was set as random effect. The concentrations, isotopic signatures, and stocks of elements in biomass, solution, soil and soil microbial biomass per cosm were included as response variable, respectively.

			OC		**TN**		**C:N**		**total dry matter**		**total OC / cosm**		**total N / cosm**		**δ ^{13}C**		**δ ^{15}N**	
	Num DF	Den DF	F-value	p-value	F-value	p-value	F-value	p-value	F-value	p-value	F-value	p-value	F-value	p-value	F-value	p-value	F-value	p-value
solutions			[mg/L]		[mg/L]													
treatment	3	8					4.39	0.0145			9.97	0.0002	1.20	0.3336				
solution	2	16					24.39	<.0001			42.59	<.0001	106.70	<.0001				
Treatment:solution	6	16					4.22	0.0057			3.65	0.0115	8.41	0.0001				
biomass			[mg/g]		[mg/g]				[g/cosm]		[g/cosm]		[g/cosm]		[‰]		[‰]	
treatment	3	8	0.51	0.69	0.54	0.67	0.14	0.94	2.45	0.14	2.63	0.12	2.43	0.14	90.6	<.0001	3.49	0.07
tissue	2	16	18.97	0.0001	46.09	<.0001	39.44	<.0001	24.82	<.0001	26.89	<.0001	32.14	<.0001	5.58	0.0145	7.61	0.005
treatment:tissue	6	16	0.60	0.73	1.03	0.44	1.79	0.17	0.88	0.53	1.01	0.45	0.76	0.61	11.13	0.0001	2.98	0.038
mineral soil			[mg/g]		[mg/g]										[‰]		[‰]	
treatment	3	8	3.20	0.08	4.17	0.047	1.18	0.38							71.1	<.0001	1.90	0.21
depth	1	8	1.47	0.26	0.11	0.749	6.98	0.03							0.4	0.55	0.004	0.95
treatment:depth	3	8	4.42	0.04	4.64	0.037	0.73	0.56							10.9	0.0033	6.33	0.017
microbial biomass			[µg/g]		[µg/g]						[mg/cosm]		[mg/cosm]		[‰]			
treatment	3	8	0.46	0.72	0.18	0.91	0.53	0.68			0.47	0.71	1.11	0.40	27.63	0.0001		
depth	1	8	46.03	0.0001	25.41	0.001	13.35	0.007			133.5	<.0001	104.76	<.0001	9.95	0.014		
treatment:depth	3	8	0.82	0.52	0.80	0.53	0.54	0.67			0.63	0.62	0.37	0.78	0.26	0.86		

Table S2: Percentage of added ^{13}C recovered in respective compartments of the different treatments with L=$^{13}CO_2$ label only, LG=$^{13}CO_2$+hopper, LG^{15}N=$^{13}CO_2$+hopper+^{15}N feces (n=3, mean±SE).

	L	**LG**	**LG^{15}N**
	[% ^{13}C recovered]		
leaves	49.8±6.1	33.1±9.9	39.7±6.6
roots	23.1±3.5	32.0±6.2	38.6±5.7
mineral soil	5.9±0.77	20.9±9.9	10.9±1.2
hoppers		0.7±0.03	0.6±0.26
feces		0.3±0.07	0.2±0.09